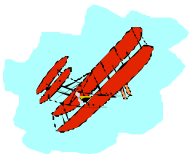
Wind Beneath My Wings
A Treasure Hunt
Kindergarten-3 Grade



Your mission, if you choose to accept it, is to investigate the fabulous four forces of flight to uncover the mystery of what "lifts" an airplane into the sky and why a heavy airplane can stay in the sky.

To uncover the mystery you/your team will research the fabulous four forces of flight (the FAB FOUR). Then you will design, construct, and test a paper airplane using your FAB FOUR expertise. Be sure to keep a flight journal of all your investigations and exciting adventures.

Your/your teams airplane will be your entry in the **FAB FOUR-FLYING EXTRAVGANZA.** Hope to see you all at the finished line.

Good luck on your mission!

Mission Control

Begin the mission by using the Internet links below to uncover the "treasures" of the four forces of flight. There are many activities that will help you understand how each force is related to flight. Design a flight journal to record all the "treasures" you uncover. After gathering information about the four forces of flight, you will use your Fab Four expertise to make a paper airplane.

Fab Four Forces Inquiries

Be sure to **record** all the **"treasures"** you uncover in your **flight journal**. The **"treasures"** you gather **will help** your **mission** be **successful**.

Begin your quest by identifying the parts of an airplane. This information will help as you uncover the fabulous four forces of flight. Be sure to record your information in your flight journal.

Use the web-links to uncover these "treasures" of flight knowledge.

Fab Four Forces Questions

Up, up and away. Find out what force holds an airplane up. What part of the airplane generates this force? How does this force work?

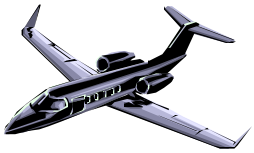
For the force that holds the airplane up there is also a force that holds the airplane down. What is this force? Where does this force come from?

What must be true about these two forces to allow an airplane to fly?

Now that the airplane is up in the air it must move forward. Find out what force is responsible for the forward movement. What part/parts of the airplane produces this forward force and how is it produced?

The forward force has an opposite force also. What is this opposite force? What does this force do? Where does this force come from?

What must be true about these forces that will allow an airplane to fly at a constant speed?



Fab Four Word Match

Can you match the force to keywords?

Lift	Down, down down
Weight	Push/Pull
Drag	Forward Force
Thrust	Up, up, up

Fab Four Internet Resources

Aviation For Little Folks (K-4)
http://spacelink.nasa.gov/Instructional.Materials/On-line.Educational.Activities/Aviation/

Off To A Flying Start
http://ltp.larc.nasa.gov/flyingstart/plane/mod1parts.html

Parts of an Airplane
http://www.grc.nasa.gov/WWW/K-12/airplane/airplane.html

Forces on an Airplane
http://ltp.larc.nasa.gov/flyingstart/forcesonplane.html

How Things Fly

http://www.aero.hq.nasa.gov/edu/

How Planes Fly?
http://www.nasaexplores.com/lessons/01-071/k-4_2.pdf

The Four Forces of Flight
http://www.nasaexplores.com/lessons/01-083/k-4_article.html article
http://www.nasaexplores.com/lessons/01-083/k-4_1.pdf activities
http://www.nasaexplores.com/lessons/01-083/5-8_1.pdf

Powering It Up
http://www.nasaexplores.com/lessons/01-085/k-4_2-t.html

Newton's Third Law
http://www.nasaexplores.com/lessons/01-085/k-4_1.pdf

What Forces Act On An Airplane?
http://quest.arc.nasa.gov/aero/background/#forces

The Aerodynamics of Things that Spin
http://quest.arc.nasa.gov/aero/events/spin/

The Flying Wing
http://www.nasaexplores.com/lessons/01-007/k-4_article.html

Jet Engine
http://www.nasaexplores.com/lessons/01-085/k-4_2-t.html

Balloon Thrust
http://www.nasaexplores.com/lsesons/01-001/k-4_1.html

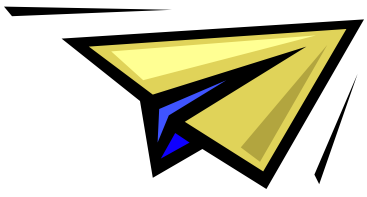
The Fab Four Extravaganza

Can you use the information that you uncovered to design a paper airplane?

Use what you have uncovered about the forces of flight to make a paper airplane. Use the Internet links below to learn more about paper airplanes. Design a paper airplane. This airplane will be your entry into the FAB FOUR FLYING EXTRAVAGANZA.

Paper Airplane Internet Links

Jline Paper Airplanes
http://www.freehomepages.com/jline/



CBC 4 Kids: Laboratory
http://www.cbc4kids.ca/general/the-lab/default.html

Air Breathing Rockets
http://www.nasaexplores.com/lessons/01-047/k-4_2.pdf

Paper Rockets
http://www.nasaexplores.com/lessons/01-087/5-8_1-t.html teacher
http://www.nasaexplores.com/lessons/01-087/5-8_1.html student

Flight Model
http://www.nasaexplores.com/lessons/01-008/5-8_1-t.html

Folding A Simple Airplane
http://edu.larc.nasa.gov/fdprint/a9.html

Paper Glider Kit
http://spacelink.nasa.gov/Instructional.Materials/NASA.Educational.Products/X1.Paper.Glider.Kit/X1.Paper.Glider.Kit.pdf

Paper Airplane Activity
http://www.grc.nasa.gov/WWW/K-12/LessonHS97/paperairplaneac.html

Folding a Jet Airplane
http://www.grc.nasa.gov/WWW/K-12/WindTunnel/Activities/foldairplane.html

RotoMotor
http://www.nasaexplores.com/lessons/01-003/k-4_2-t/html

Ken's Paper Airplanes
http://www.paperplane.org

Just Plane Fun
http://www.sonywonder.com/wonderland/sandbox/justplane/index.html

Air Force Link Jr.
http://www.af.mil/aflinkjr/

Test your airplanes.

Make teams of 4 people and test your airplanes. Before conducting the following tests, predict what you think will happen. Watch the airplanes carefully to answer the questions below. Test the planes several times to see if they always perform in the same way. Write or draw what you see in your flight journal.

1. Which one can fly in a straight line?
2. Which one can fly the longest distance?
3. Which one can stay in the air the longest?
4. Which one can fly the highest?
5. Which one can fly the fastest?
6. How can you make your airplane better?
7. Will adding weight (such as a paper clip or a penny) make it fly better or worse?
8. Does it matter where you put the extra weight?
9. Do larger planes fly better than smaller planes?

Discuss your answers with your teammates. Could you improve on your airplane design?

CONGRATULATIONS!
YOUR MISSION HAS BEEN ACCOMPLISHED!

YOU HAVE BEEN INDUCTED INTO THE FAB FOUR HALL OF FAME!

TEACHER'S NOTES

The intent of the Treasure Hunt is to guide the student into more reflective thinking by using the information they have uncovered on the Web to answer a question or solve a problem. The students should be able to synthesize the information they have learned and shape it into a broader understanding of the big picture.

KINDERGARTEN/FIRST GRADE

One of the largest drawbacks for Kindergarten and First grade using Web activities is that the readability of the sites is often not appropriate for the developmental level of the learner. For that reason, it is suggested that this activity is done either as a whole group

lesson with a presentation station or in small groups with a teacher, perhaps as a center within the classroom that students rotate through. Students should design and keep a flight journal of the information uncovered during their experiences. The flight journal recordings should reflect the level of the student, from pictorial representations to written communications. The learner's inferences should also be reflected in the journal and/or through class discussions. These reflections could be listed on a classroom chart with the student's initials next to their contribution. It is important to give students the opportunity to express their inferences and discuss them. This is a valuable imbedded assessment tool for the teacher and allows for the identification of misconceptions that can be addressed early in the learning experience. This experience enhances the critical thinking ability of early learners.

SECOND AND THIRD GRADE

The learners in second and third grade should work in partners to complete the Treasure Hunt. Each student should design a flight journal and keep a record of their findings in that flight journal. The flight journal should reflect facts uncovered and inferences of the learner. This is a great assessment tool for uncovering misconceptions of the learner. The critical information for the learner to understand is how the forces of flight work together and allow aircraft to fly. This information will be used to design and test their paper airplane.

STANDARDS

PHYSICAL SCIENCE CONTENT STANDARD B

All students should develop an understanding of properties of objects and materials.

All students should develop an understanding of position and motion of objects.

SCIENCE AND TECHNOLOGY CONTENT STANDARD E

All students should develop abilities of technological design